
NIGERIAN *SOLANUM* SPECIES OF ECONOMIC IMPORTANCE

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Abstract

Many *Solanum* species that occur in Nigeria are sources of food and medicinal products. The domesticated species especially serve as sources of edible fruits and vegetables. Many of the species remain good sources of diosgenin and solasodine, chemicals of great importance in the steroid industry.

The genus *Solanum* is represented by some 25 species in Nigeria, including five introductions: *S. mammosum*, *S. tuberosum*, *S. melongena*, *S. wrightii*, and *S. seaforthianum* var. *disjunctum* (Gbile, 1987). *Solanum macrocarpon*, *S. aethiopicum*, *S. scabrum*, *S. melongena*, *S. gilo*, *S. indicum*, *S. anomalum*, *S. americanum*, *S. nigrum*, and others are domesticated, and their leaves or fruits or both are eaten as vegetables and used in traditional medicine. Many other *Solanum* species grow wild and are less known or used.

Chemical information on the Nigerian *Solanum* species is scanty and it is difficult to assess the values of these species in this regard.

The present article reports on the protein content of some domesticated *Solanum* species and also reviews the economic importance of the Nigerian *Solanum*.

SOLANUM SPECIES AS FOOD PLANTS

The common *Solanum* species that are used for food include *S. tuberosum*, "Irish potato," which grows well in the highlands; *S. melongena*, "aubergine" or "eggplant," which flourishes in the lowlands; *S. americanum*; *S. nigrum*; and the additional species listed in Table 1. *Solanum anomalum*, *S. gilo*, and *S. melongena* provide edible fruits. Fruits and leaves of *S. aethiopicum* and *S. macrocarpon* are edible, and only the leaves of *S. scabrum*, *S. nigrum*, *S. americanum* are eaten as vegetables. While the fruits of *S. aethiopicum* and *S. gilo* are usually eaten raw or are steamed before eating, the leaves of *S. aethiopicum*, *S. americanum*, *S. macrocarpon*, *S. nigrum*, and *S. scabrum* are usually boiled. The relative bitterness of the leaves and fruits dictates to a great extent which

is edible vs. poisonous. Bitterness has been attributed to steroidal alkaloids in these plant parts.

DETERMINATION OF PROTEIN AND ASH (MG, P) IN *SOLANUM* EDIBLE SPECIES

MATERIALS AND METHODS

The *Solanum* species were interplanted in the same experimental plot behind the Forestry Research Herbarium, in Ibadan. After fruiting, each species was sampled and separated into edible leaves and fruits. Plant materials were dried in an oven to constant weight at 60°–70° C and ground to pass through a 1-mm sieve in a Thomas-Wiley meal in preparation for chemical analyses. All determinations were prepared in duplicates.

Nitrogen was determined by the semi-micro Kjeldahl procedure using selenium as catalyst. Percentage of crude protein content was obtained by multiplying N₂ content by 6.25. In the determination of phosphorus and magnesium, samples of 0.5 g were digested using a mixture of nitric acid and perchloric acid. Phosphorus was determined by colorimetry using vanadomolybdate yellow color development, while magnesium was also determined colorimetrically by the titan-yellow method. The results are detailed in Table 1.

SOLANUM SPECIES AS MEDICINAL AGENTS

Many *Solanum* species are used in indigenous medicine to counter ailments as listed in Table 2.

Many of these species are employed as tonics, antirheumatics, remedies for colds, fevers, and dizziness, and are eaten as vegetables for their high nutritive values or as potherb as mild anticonvulsants. Modern research has shown that some *Sola-*

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TABLE 1. Protein and ash content of some edible *Solanum* species.

Species	Organ	% Crude Protein	% P	% Mg
<i>Solanum macrocarpon</i> L.	fruit	1.4	0.25	0.12
<i>S. macrocarpon</i>	leaf	2.4	0.44	0.40
<i>S. aethiopicum</i> L.	fruit	1.6	0.38	0.26
<i>S. aethiopicum</i>	leaf	3.2	0.37	0.38
<i>S. scabrum</i> Miller	fruit	1.8	0.36	0.16
<i>S. scabrum</i>	leaf	2.9	0.40	0.44
<i>S. melongena</i> L.	fruit	1.6	0.25	0.08
<i>S. gilo</i> Raddi	conical fruit	1.2	0.47	0.17
<i>S. gilo</i>	spherical fruit	1.3	0.45	0.22
<i>S. indicum</i> L. subsp. <i>distichum</i> Thonn.	fruit	1.4	0.46	0.27

num species have antiviral, anticancer, anticonvulsant, and anti-infective agents.

Antiviral activity has been demonstrated in extracts of *Solanum melongena*, *S. nigrum*, and *S. tuberosum* (Roychoudhury, 1980). Weak anticonvulsant activity has also been demonstrated in extracts of *S. dasyphyllum* fruit (Adesina, 1985), *S. aethiopicum* leaf, *S. americanum* leaf and unripe fruit, *S. melongena* root, and *S. scabrum* leaf and fruit (Adesina et al., 1985). Besides, all the extracts examined for anticonvulsant activity exhibited an interference on the functions of the CNS to varying degrees. Anticonvulsant activity has been related to the presence and concentration of scopoletin and related coumarins found present in most *Solanum* species examined (Adesina et al., 1985). The anticonvulsant, sedative, hypotensive, and antipyretic properties of scopoletin and scoparone have been reported before by many workers (Jamil et al., 1972; Adesina et al., 1981; Ojewole & Adesina, 1983a, b; Adesina et al., 1985).

Chemical and biological work on immature berries of *Solanum nigrum* showed that the berries possess anticancer activity. 3-O- β -lyco-tetraoside, desgalactotigonin, and solamargine isolated from the berries showed inhibitory activity against JTC-26 (100, 97.9, 100%, respectively in concentration of 15 μ g/ml) (Saijo et al., 1982). It has also been shown that the crude alkaloid fraction isolated from the leaves of *Solanum melongena* exhibited significant analgesic effect and some CNS depression in mice but no anticonvulsant action (Vohora et al., 1984). This effect was also noted for *S. scabrum* alkaloidal fraction (Adesina & Gbile, 1984).

Molluscicidal activity was examined in some *Solanum* species. All the parts of *S. americanum* were found toxic to *Biomphalaria glabrata* and

B. globosus used as test snails and could possibly be used to check schistosomiasis.

SOLANUM SPECIES AS SOURCES OF PHARMACEUTICALLY IMPORTANT CHEMICALS

Some *Solanum* species have recently assumed great importance as rich sources of precursors of steroid drugs. Steroidal raw materials have been found useful in cardiovascular therapy, as human abortifacients, as anti-inflammatory agents, and as menopause regulants and are now known to influence the CNS. Many researchers have investigated *Solanum* species for their steroidal sapogenin and alkaloid content with a view to determining the quantities of these compounds.

Indrayanto et al. (1985) recently examined the fruit of *Solanum wrightii* chemically for its solasodine content.

Pharmaceutically important compounds diosgenin and solasodine were isolated from the tissue samples of *Solanum verbascifolium* in appreciable amounts (Jain & Sahoo, 1981a, b). The leaf was found to contain solasodine (0.26%), tomatidine (0.05%), solaverbascine (0.01%), progesterone (0.001%), 16-pregnenolone, and other compounds (Adam et al., 1979, 1980). Telek (1979) found a very good yield of crude solasodine, suitable for the commercial synthesis of 3 β -acetoxy-5, 16-pregnadiene-20-one, in *S. mammosum*.

Studies on *Solanum nigrum* berries by Bose & Ghosh (1980) revealed that solasodine content of the berries varies from 5–6% in ripe berries to 4–5% in unripe berries and that this could be exploited for commercial synthesis of new drugs. Tigogenin and diosgenin have also been reported from the plant. The unripe fruit of *S. incanum*, on examination by Segal et al. (1977), led to the identifi-

TABLE 2. Some medicinal and food uses of *Solanum* species.

Species	Medicinal and Food Values
<i>Solanum aculeatissimum</i> Jacq.	Fruit used in enema, constipation
<i>S. aethiopicum</i>	Ripe fruits edible raw or when cooked, fruits remedy for colic and flatulence; potherb
<i>S. americanum</i> (L.) Jacq.	Fruit and leaf used as digestive tonic, diuretic, depurative, and antiparasitic; plant has high nutritive values and eaten as vegetable or in soup after cooking; whole plant used to remove dizziness due to epilepsy and other disorders
<i>S. anomalum</i> Thonn.	Serves as vegetable, laxative, and treatment of ear sores and infections
<i>S. erianthum</i> G. Don	Roots and fruits deliriant, purge, diuretic, and cholagogue
<i>S. gilo</i>	Restorative, fruit eaten raw as vegetable, has high nutritive values; remedy for fevers and dizziness, weak anticonvulsant
<i>S. incanum</i> L.	Used to treat syphilis, fruit for patients with high blood pressure
<i>S. macrocarpon</i>	Bitter fruit edible when cooked; plant cultivated as potherb, fruit and leaf eaten in soups and sauces
<i>S. melongena</i>	Root and boiled fruit used as antirheumatic, digestive tonic, and for veterinary purposes; all three varieties of fruit with high nutritive values as vegetable when cooked; plant used for various skin diseases and infections and to relieve excitement in nervous diseases
<i>S. nigrum</i> L.	Anticonvulsant, African remedy for malaria, fever, dysentery; antispasmodic, diaphoretic, and sedative; ripe fruit and leaf eaten after cooking as digestive tonic; whole plant used as medicine for eye, heart, and liver
<i>S. scabrum</i> L.	Anticonvulsant, digestive tonic, leaf boiled and eaten as vegetable; has high nutritive values. Whole plant sedative, depressant, anticonvulsant and antiparasitic
<i>S. torvum</i> Sw.	Ripe fruits edible (eaten in India) and used medicinally for liver and spleen complaints; fruits expectorant and sedative

cation of diosgenin and yamogenin in fairly large concentrations suitable for chemical development. *Solanum macrocarpon* furnished solasodine, tomatidine, diosgenin, and sitosterol on chemical hydrolysis. Recent chemical examination of some other Nigerian *Solanum* by Adesina & Gbile (1984) and Adesina (1985) revealed large amounts of solasodine, diosgenin, and tomatidenol in *S. scabrum* and *S. dasyphyllum* fruits.

CONCLUSION

From Table 1, it can be seen that the edible tissues examined contain a high percentage of protein and remain a good source of ash for use as vegetables.

Wild *Solanum* species are less studied than domesticated species. Despite this, the Nigerian *Solanum* remains a good source of pharmaceutically important chemicals and of vegetable for the teeming population.

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